1 OF 1

FOR OFFICIAL USE ONLY

JPRS L/8249

29 January 1979

USSR

TRANSLATIONS ON USSR RESOURCES
(FOUO 2/79)

U. S. JOINT PUBLICATIONS RESEARCH SERVICE

FOR OFFICIAL USE ONLY

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100010056-8

BIBLIOGRAPHIC DATA SHEET	1. Report No. JPRS L/8249	2.	3. Recipient's Accession No.
4. Title and Subtitle TRANSLATIONS ON USSR RESOURCES, (FOUO 2/79)			5. Report Date 29 January 1979
			6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.
			11. Contract/Grant No.
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered
			14.
15. Supplementary Notes			
16. Abstracts This serial report contains information on energy, fuels and related equipment; fishing industry and marine resources; water resources, minerals, timber, and electric power.			
17. Key Words and Document Analysis. 17a. Descriptors USSR Natural Resources Electric Power Energy Energy Conservation Fisheries Fuels Minerals Timber Water Supply			
17b. Identifiers/Open-Ended Terms			
17c. COSATI Field/Group 5C, 10, 21D, 2C, 8G, 2F			
18. Availability Statement FOR OFFICIAL USE ONLY. Limited Number of Copies Available From JPRS		19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 39
		20. Security Class (This Page) UNCLASSIFIED	22. Price

FORM NTIS-35 (REV. 3-72)

THIS FORM MAY BE REPRODUCED

USCOMM-DC 14952-P72

JPRS L/8249

29 January 1979

TRANSLATIONS ON USSR RESOURCES

(FOUO 2/79)

CONTENTS PAGE

ELECTRIC POWER AND POWER EQUIPMENT

UDC 658.589.011.46

PROBLEM SOLVING IN THE INTRODUCTION OF NEW EQUIPMENT

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 10, 1978 pp 84-87

[Article by Candidate of Technical Sciences Yu. A. Gabliya, engineers A. B. Rubinshteyn, I. A. Kirtbaya, E. A. Ovcharov, V. V. Yeremenko, L. G. Nikolaichev, L. A. Kostrov]

[Text] The existing procedure for the development of technical documentation with respect to new equipment, the manufacture, testing and introduction of experimental models, the preparation and distribution of the corrected technical documentation to the enterprises for mass manufacture and introduction, the organization of mass manufacture and introduction, the consideration of the efficiency from the introduction of new technical solutions (materials, products, structural elements, mechanisms, technology, attachments, equipment, and so on), the procedure for moral and material incentive of the organizations have a number of significant deficiencies, the basic ones of which are as follows:

1. The absence of deep, comprehensive discussion and analysis of new technical proposals on a high scientific and technical level with the participation of representatives of all of the organizations which determine the results of the implementation of a given technical solution on various levels and the organization of its mass introduction into production in the initial stage of formation of the plan with respect to the new equipment.

At the present time the inclusion in the plan and the discovery of financing with respect to a particular topic depend quite frequently on the persistence of the author (a group of authors).

The amount of money allocated for the development, manufacture and introduction of a new technical design, as a rule, is not confirmed by exact calculations in accordance with the existing standards (even with a defined safety margin). As a result, significant amounts of money are taken out of state circulation and frozen.

2. The coexecutive organizations frequently are not involved in the discussion of the topic in advance and become coparticipants in the operation automatically.

Even if they are informed in advance on the necessity of participating in the work, they are not provided with clear data not only on the problem as a whole, but also specific functions and also complexities which can arise when implementing the stated goal.

The given operations do not find the necessary reflection in the plans of the coexecutive organizations for the topic. The work is as a rule suddenly thrust upon them with all of the consequences of an emergency nature arising from this. Accordingly, the coexecutive organizations try will all possible means to decline responsibility for the performance of work that they have not agreed on (and sometimes agreed on), referring to the absence of technical or organizational possibilities, materials, equipment, the presence of stressed inhouse plans, and so on. As a result, further work on the new solution is slowed and extended over a prolonged period of time, and sometimes it is even stopped altogether.

The absence of serious collective analysis, personal responsibility for the topic and a prospective schedule for performance of operations becomes the cause of the fact that orders for materials, equipment and machinery are not compiled by a clearly defined time; that is, at the time when it is necessary to begin work all of the coexecutive organizations (including the supply and planning organizations) are only beginning to prepare for execution of the design, meeting with difficulties in obtaining the necessary materials, machinery, and so on not provided for in advance by the planning agencies and for which the required limits are absent.

3. Frequently it occurs that an experimental model of the product (structural design) has already been manufactured, and it does not appear possible to introduce it inasmuch as there is either still no technical documentation or it arrives with a great delay. As a result, the time for the introduction of new machinery or a modified version of it is extended unreasonably, and the machinery becomes obsolete.

4. As a result of the absence of the required responsibility on the part of the participants, cases have been observed where the technical documentation is incompletely corrected and therefore it is not accepted fully by the next executive agents which frequently leads to a delay in operations.

5. The existing system for calculating the planned efficiency and bonuses for performing work on new techniques or equipment is far from perfect. The total expenditures on the operations with respect to the topic and the total savings proposed in the USSR Ministry of Power Engineering for payment of bonuses for the introduction of a new technical design have not been properly indicated, that is, the total expenditures in all phases of the development, manufacture and introduction of the new equipment can exceed the total savings proposed for the payment of the bonus, and the bonus will still be paid (for example, the total expenditures have amounted to 200,000 rubles, and the savings, 100 thousand rubles; the total bonus paid is 10 thousand rubles.

In addition, there is no clear regulation of the bonus distribution among the coexecutive organizations considering the specific contribution and degree of complexity of the work performed by each agent. This sometimes leads to the fact that bonus is paid to all the people who have participated in any way in the indicated work. In this case the bonus totals are comparable to the total received by the basic organizations.

6. The USSR Ministry of Power Engineering has no single active agency to control the work of introducing new techniques for equipment. The scientific and technical council does not participate actively in this work. No one bears responsibility for extremely slow introduction.

It must be noted that this situation is reflected also in the course of socialist competition inasmuch as the obligations assumed by the coworkers, divisions, brigades and organizations on the part of operations on new equipment are acquiring a formal nature. For example, the obligation is assumed to complete and produce the technical documents 10 days ahead of the planned time. The obligation is satisfied, the documents are sent for investigation to the confirming (coordinating) instance or plant (trust), and the document stays there for an undefined time without review. As a result, compiling the document ahead of time loses any meaning. The analogous situation also occurs in the case where a plant has performed its work ahead of time, and the introducing organization does not realize this gain in time.

Thus, in the final analysis the obligations acquire a formal nature, and socialist competition is dealt a moral loss.

In implementing the historic resolutions of the 25th Congress of the CPSU and being guided by the principles and conclusions contained in the speech by L. I Brezhnev at the December (1977) Plenum of the Central Committee of the CPSU and also the Letter of the Central Committee of the CPSU, the USSR Council of Ministers, the All-Union Central Trade Union Council and the Central Committee of the All-Union Lenin Young Communists League "On the Development of Socialist Competition for the Fulfillment and Overfulfillment of the 1978 Plan and Intensification of the Struggle to Improve Production Efficiency and Work Quality," the collectives of the VGPIiNII Institute, Energoset'proyekt, the Zapsibelektroset'stroy and Tsentrstroyelektroperedachi Trusts, the Ivanovo Machine Plant, the Domodedovsky Metal Structural Element Plant of the USSR Ministry of Power Engineering include a report on the scientific and technical cooperation and socialist competition. These collectives are appearing as the initiators in the movement "for each new technical solution, a personal accounting" ("for each new technical solution, an effective complex introduction system").

Problems of the Movement

1. The maximum reduction of time from the beginning of the development of technical documentation to the mass introduction of a new economic, advanced technical solution (the technical idea).

2. The maximum reduction of the cost of operations with respect to introduction in all phases.

3. Improvement of the efficiency of socialist competition in the collective and its maximum specification.

4. Ensurance of the possibility of performing extra plan operations and the achievement of savings of capital and labor expenditures as a result of it.

5. Obtaining additional savings from capital expenditures, materials and labor expenditures as a result of reducing the times for the introduction of new technical solutions.

6. Improvement of the responsibility of the leaders and executive agents for the operations in all phases of introduction.

7. Improvement of the guarantees with respect to the selection and inclusion in the plan for new equipment of effectively urgent and economical (advanced) new technical ideas.

8. Improvement of the planning role in the performance of the operations with respect to the new equipment and the creation of a united controlling agency.

9. Improvement of the role of the scientific and technical society.

10. Exclusion of unfounded expenditure of state means allocated for bonuses.

11. Bringing order into the method used in determining the bonuses and ensurance of conditions under which the actual participants (organizations) in the given work receive the bonuses (moral and material).

Organizational Structure of the Movement

By resolution of the USSR Ministry of Power Engineering, above all the chief organization for coordination of all operations with respect to an area is designated (for example, the Energoset'proyekt Institute deals with the problems of electric power network construction). In the future the introduction work will be divided into the following stages.

Stage 1. The annual collection of proposals with respect to the new technical solutions, mechanisms, attachments, and so on from the scientific research and planning and design organizations, the enterprises of the construction industry, the construction and operation and maintenance organizations have been organized (a list of organizations and request form and also the subsequent formulation of the presented materials are prepared by the Energoset'proyekt Institute).

The working (permanently active) commission made up of highly qualified specialists from all of the coexecutive organizations is created. All of the members of the working commission constitute part of the construction section of the expanded scientific and technical council of the Energoset'proyekt Institute. The operating commission considers the incoming proposals, selects the basic ones and prepares them for investigation at the scientific and technical council where the results of preliminary analysis are investigated. For a more detailed study of the proposal, the working commission invites its authors to the scientific and technical council.

In the expanded scientific and technical council an analysis is made of all of the proposals with respect to new technical solutions presented by the organizations for inclusion in the plan with respect to the new equipment of the USSR Ministry of Power Engineering, and the plan for the basic and auxiliary topics is approved. Estimates are compiled for all the topics (basic and auxiliary), and the times for their execution are determined in accordance with the existing normative documents (that is, the planned costs and times are noted). By recommendation of the scientific and technical council of the institute the basic topics are included in the plans for financing operations with respect to new techniques and equipment of the USSR Ministry of Power Engineering for the next year, and the materials are transferred to the scientific and technical council of the USSR Ministry of Power Engineering.

The scientific and technical council of the USSR Ministry of Power Engineering hears the topic presented by the scientific and technical council of the Energoset'proyekt Institute and in case of approval (with the required corrections) a recommendation is made to the GPTUS to include the indicated topics in the ministry plans for the next year. The materials must be presented to the GPTUS in the third quarter of the current year.

The indicated topic is agreed on with the leaders of the main administrations to which the coexecutive organizations of each topic are subordinate (they sign the personal account). The coexecutive organizations for the topic designate the responsible executive agents (with indication of the complete list of executive agents in accordance with the given topic from each organization).

The main production-technical administration for construction approves the presented plan with respect to new equipment and the personal account for each topic is opened up. The personal accounts are approved by the minister (deputy minister) of power engineering and electrification of the USSR. In order to realize control of the course of the operations with respect to the topic, the representative from among the inspection agencies is designated. In the case of necessity, the commissions to the various administrations of the ministry are entered in the personal account (for example, the Glavsnab, and so on). After the minister signs the personal account, the indicated commissions acquire the form of an order.

Before presenting the personal account for a new technical design for approval to the ministry, it is presented for signature to the party committee secretary, the chairman of the local committee and the secretary of the committee of the All-Union Young Communists League of the USSR Ministry of Power Engineering

Copies are made of the personal account which are distributed to all of the coexecutive organizations and the scientific and technical councils, the party, local committees and the committees of the All-Union Lenin Young Communist League of the USSR Ministry of Power Engineering. The original is transmitted to the minister's inspection board for review of the course of performance of the operations.

Phase 2. After receiving the approved personal account, the planning organization develops the socialist competition, it develops the creative plans with respect to early compilation of the technical documents.

In accordance with the adopted socialist obligations, the planning organization develops the technical documentation ahead of time. As the completion of the development of the technical documentation approaches, the next organization (plant or construction trust) is informed in advance that they have been prepared for the beginning of their work phase.

The developed technical documentation is sent to the plant and to the trust. The document on early sending of the technical documentation to the next executive agent is forwarded to the monitoring agency--the minister's inspection board. The personal account indicates the early performance of the work by the planning organization. When questions arise at the plant, the planning organization gives it operative assistance on the order of a creative author's review.

The group performing the work ahead of time proceeds with the development of the next topic with respect to the basic plan for which financing has been provided by the USSR Ministry of Power Engineering, and so to completion of the entire thematic plan. After execution of the basic thematic plan and informing the scientific and technical council of the Energoset'proyekt Institute of this (if there was one topic, then after completion of it) it is recommended that at the expense of the saved time the given group begin the preparation of the technical documentation on one of the topics of the auxiliary plan for which financing has not been provided from the state budget in the current year. The group proceeds with the development of the indicated topic, informs the coexecutive agents of this so that they will prepare for its execution in all phases. The sequence of this work is the same as in the stages of execution of the basic plan. After completion of the additional work and informing the minister's inspection of this, data is entered in the personal account on the execution of the plan and the savings of state resources achieved in doing this.

If in addition to preparing the documents for the product (structural element) it is necessary to develop (or modify) a machine (attachment) for introduction of the product into the practice of electric power network construction, the development of the required technical documentation and the manufacture of the experimental industrial model are carried out considering that the mechanism will appear in the experimental section of the route (or test ground) simultaneously (or with minimum delay) with the structural element or product. This is necessary in order that the product be tested or be subjected to experimental industrial introduction without delay.

Phase 3. The manufacturing plant plans the production of the experimental industrial models of the product or machine in advance. On development of socialist competition in the brigade (shop) the collective aims at overfulfillment of the plans with respect to mass production, the creation of the intermediate product and time reserved for the manufacture of the new product.

After receiving the technical documentation with respect to the new decision, the plant provides for early manufacture of the product (machine) and shipment of it to the next organization. A copy of the shipping document to the user is presented to the minister's inspection board where the actual times of performance of the operation and its cost are recorded on the personal account. If a number of topics are being developed, the sequence of performance of the operations, including the extra-plan operations, is retained.

Phase 4. The construction trust also plans in advance the performance of operations with respect to the introduction of new technical designs, it provides for the socialist competition and the machine fleet (trust), directing the work of introduction, the basic goals of which are overfulfillment of the planning indexes, the creation of the stock of components and time reserve for experimental and the experimental-industrial work on the new technical design. After obtaining the required technical documentation for the experimental product (mechanism) the construction trust informs the inspection board of the minister and the shipping organization of this and proceeds (calling on the designer and plant representatives if necessary) with the performance of this phase of the work. The course of these operations is monitored by the responsible representative of the customer (power system). The document establishing completion of operations (in accordance with the existing requirements) is approved by the customer and is sent to the minister's inspection board.

The effective technical-economic indexes are reflected in the document. It is also indicated whether a new solution to the mass introduction (limited or with any correction to mass introduction, and so on) is recommended. It is desirable that if possible specific objects of introduction be indicated in the area of activity of the power system during the current year and the proposed times for correction of the technical documentation with respect to the given objects by the design organizations (which ones are specifically indicated). The experimental-industrial introduction ends with this phase.

Phase 5. The minister's inspection board informs the scientific and technical council of the USSR Ministry of Power Engineering of completion of the experimental-industrial introduction of the new technical design into construction practice. The scientific and technical council sums up the planned and actual expenditures of time, means and materials, defines the cost benefit achieved and prepares proposals for the administration of the USSR Ministry of Power Engineering with regard to rewarding the participants and coexecutive organizations with certificates (diplomas, pennants) and money prizes (a defined percentage of the money savings achieved in the given phase of experimental-industrial introduction). All of this is reflected (after approval by the administration of the USSR Ministry of Power Engineering) in the personal account. Simultaneously, the scientific and technical council of the USSR Ministry of Power Engineering designates the required indexes with respect to savings, the achievement of which must be ensured by the coexecutive organizations (on making the transition to mass introduction this list can be supplemented), after which they will be paid a bonus for introduction of the new technique or equipment (by the system existing at the present time).

The savings indexes are designated beginning with calculation of the required excess over the income of the government for each expended ruble. For example, the total expenditures with respect to the topic in all introduction phases (the development of technical documentation, the manufacture of the experimental-industrial model, mass manufacture, experimental-industrial introduction, mass introduction, correction of documentation with respect to specific objects of introduction) have amounted to 246,000 rubles. The scientific and technical council has designated a cost benefit index of 5 (that is, it is necessary to obtain 5 rubles of savings for each ruble expended by the government). Thus, in order to receive a bonus (the final sum) for the new equipment the coexecutive organizations must present documents confirming that savings have been obtained which are equal to 246,000 rubles x 5 = 1,230,000 rubles. This total can include the previously obtained savings in the experimental-industrial introduction phase.

When designating the total required savings the scientific and technical council determines in advance the percentage bonus with respect to the saved total and the percentage distribution of it among the participants in the work. Out of the total bonus (final bonus) the total bonus paid previously after completion of the experimental-industrial introduction phase can be subtracted.

In addition, the scientific and technical council of the USSR Ministry of Power Engineering must develop a system of penalties for the coexecutive organizations which have not met the given deadlines when performing the operations planned in their phase.

Phase 6. After the documents reached the scientific and technical council of the USSR Ministry of Power Engineering confirming the achievement of the given indexes with respect to cost benefit, a study is made of the problem of paying the final compensations and the forms of moral incentive to the participants in the work; then the sums are found with respect to introducing the new technical design. The proposals of the scientific and technical council are considered and approved by the administration. This is also entered in the personal account for the topic after which it is closed.

At general meetings of the collectives everyone is informed of the decision of the ministry administration, and the bonuses, certificates, diplomas, pennants, and so on are passed out.

By the totals for the year (considering the entire thematic plan with respect to the new equipment) the USSR Ministry of Power Engineering determines the best organizations with respect to introduction of new technical designs, which is taken into account when summing up the results with respect to socialist competition (with respect to all divisions of activity) among the collectives. When an organization achieves excellent indexes with respect to introduction of a set of topics, it would be highly desirable to send it a congratulatory letter of appreciation (to the brigade, the division, the collective as a whole) signed by the minister (deputy minister), the party committee secretary, the chairman of the local committee and the secretary of the committee of the All-Union Lenin Young Communist League of the USSR Ministry of Power Engineering.

10845
CSO:1822

ELECTRIC POWER AND POWER EQUIPMENT

SUPPLYING AGRICULTURE WITH ELECTRIC POWER EQUIPMENT

Moscow ELEKROTEKHNIKA in Russian No 11, Nov 78 pp 1-4

[Article by Ya. N. Zarobyan, Deputy Minister of Electrical Equipment Industry USSR: "Most Important Tasks in Supplying Agriculture With Electrical Equipment"]

[Text] The role of the electrical equipment industry in raising the effectiveness of farm production is substantial: it forms the scientific-technical base for electrification of agriculture, and consequently, determines the electrical equipment ratio and the productivity of many types of work, including quite-labor intensive work, in animal husbandry and poultry farming, plant husbandry and fuel operations, reclamation, and irrigation.

In the years preceding the March 1965 Plenum of the CC CPSU, which mapped out the course of action of further upgrading agriculture on an industrial basis, our sector did a great deal of work to develop and strengthen the rural electricity base. The attention of scientists, engineers, workers, and production organizers was focused on problems of developing and assimilating a large complex of electrical equipment intended for agriculture, the creation and expansion of productive capacity to produce them, in order to increase deliveries of electrical equipment, especially complete sets of equipment to meet the needs of farm production.

The conversion of animal and plant husbandry to an industrial basis, increased production of equipment for the processing, storage, and rational utilization of farm goods, and also equipment for feeds production--all of these required that workers of the sector create, develop, and deliver special electric engines capable of operating under difficult conditions in farm facilities, also various sets of devices to run such specific processes as the making and dispensing of feeds, maintaining parameters of the microclimate, cleaning the facilities and recovering production wastes, processing and storing food, feed, and seed grain, processing vegetables and potatoes, storing fruit, supplying water, and so on. It is sufficient to note that the number of electric engines on kolkhozes and sovkhozes has increased by 4.8 times over 1965, reaching a total of ten million with an overall capacity of 53 million kilowatts, while a number of electric units serving technological processes has risen sevenfold, reaching 1.7 million with a total capacity of 12 million kilowatts. To this should be added the large number of special devices for radiation and illumination, also special electro-thermol units such as electric heaters and heating units, water heaters, infra-red radiators, tubular heaters, and so on.

At present, agriculture is getting 228 types of electrical equipment, including 153 designed for farm use (in 1965 such equipment was not being produced, in 1970 there were 50 types, and in 1975--130 types).

The use of new types of electrical equipment is helping to substantially boost effectiveness in farm production. Thus, the set of electrical equipment to run technological processes in livestock complexes accommodating 108,000 and 50,000 hogs and 10,500 head of cattle makes it possible to reduce labor outlays to 1.5 to 2.0 man-days per quintal of pork and 2.5 to 3.0 man-days per quintal of beef. The economic effect per complex is 900,000 rubles. Sets of non-contact control devices to regulate the microclimate in livestock and poultry facilities help to raise egg-laying capacity by 6.4 per cent and livestock weight gain by 10 per cent. The economic effect of adoption is 1,240 rubles per device. Sets of electrical equipment to regulate technological processes in large-scale hothouse combines and selective breeding centers makes it possible to boost crop yields by 15 to 20 per cent and to reduce labor outlays by 2.5 by 2.8 times; the national economy effect from the use of such equipment is 260,000 rubles on three hectares. The use of OSPO-2 type irradiaters in livestock farming helps to boost the weight gain of young animals up to 14 per cent, and the economic effect per unit is 30 rubles.

The average annual economic effect from the adoption of new types of electrical equipment in agriculture comes to about 80 million rubles.

The July 1978 Plenum of the CC CPSU focused the attention of the industrial ministries on the necessity of further strengthening efforts to intensify agricultural production on the basis of comprehensive mechanization and electricification. Workers of the electric equipment industry drew a single conclusion from the decisions of the Plenum and the report given there by CC CPSU General Secretary and USSR Supreme Soviet Presidium Chairman Comrade L. I. Brezhnev: it is essential to critically evaluate the results of what has been done, to concentrate efforts on overcoming a number of shortcomings holding back the rise in the power-to-worker ratio on kolkhozes and sovkhozes, on resolving tasks with respect to improving the quality and reliability of electrical equipment for the farm.

It must above all be admitted that for a number of reasons electricification--a powerful factor in boosting agricultural effectiveness--is still not being fully utilized. Despite the fact that in the past ten to 12 years the consumption of electricity in agriculture has risen almost fourfold and today exceeds 80 billion kilowatt hours, the power-to-worker ratio on kolkhozes and sovkhozes is substantially lower than in such comparable sectors as light and food industry. Clearly, electricity is not being utilized in sufficient volume directly in technological processes. On most farms, the level of electrical mechanization is too low in such operations as the cleaning of animal and poultry facilities, the making and dispensing of feeds, and so on.

To a certain extent all of this can be considered the consequence of the fact that farm production's electrical equipment needs are not being fully met. According to data of the Ministry of Agriculture, Soyuzsel'khoztekhnika, and the Ministry of Land Reclamation and Water Resources, agriculture does not have enough electric engines of up to 100 kilowatts capacity, especially of the sizes 7, 8, and 9 to run farm machinery and mechanisms, switches and automatic switch-offs designed to be impervious to dust and chemicals, electric heaters, water heaters, lighting fixtures, large vertical electric engines for pumping stations, special sets of transformer substations of up to 5,300 kilovolt-amperes capacity, 110 and 35 kilovolts for outside installation, and other equipment.

Thus, it is the priority task of our sector to meet agriculture's need for electrical machinery, equipment, automation devices, wiring and cables, and other products.

This task must be resolved on the basis of improved quality indicators of equipment and compliance with operating specifications. During the 9th Five-Year Plan, the sector concentrated on boosting the quantity of electrical equipment for agriculture; now, we must focus on raising durability and reliability. There are substantial unutilized reserves for this.

The effective utilization of electrical equipment in farm production depends largely on the level of organization of the engineering and operational service. Frequently because of staff limitations as well as the very small number of specialist electricians being sent to the farms, many oblasts and most rayon farms lack an operations service. Because of the low level of operation, electrical equipment and apparatus being utilized on the farms go out of commission long before they should, and in some cases are wearing out. The rate at which electric engines are going out of commission throughout the country as a whole exceeds 20 per cent, annually causing 200 to 300 million rubles of loss to the national economy. And most of the breakdowns are occurring in agricultural processes.

Electrical equipment industry workers have already undertaken a number of measures to raise the operational reliability of the electrical equipment designed for agriculture. The collective of NIPTIEM [Scientific-Research, Planning-Design, and Technological Institute of Electrical Machine Building], for example, has developed a built-in temperature shield for asynchronous engines. These devices reliably protect electric engines in cases of prolonged overload, improper processes of start-up and braking, frequent switch-ons, phase cutoff, jammed rotor, high environmental temperature, and breakdowns in the cooling system. For the first time, the complex has successfully resolved the problem of temperature protection: asynchronous engine--temperature-sensitive element--protection device. Electric engines with the built-in temperature device have shown high effectiveness in operation. The annual national economy effect for 100,000 asynchronous engines equipped with the device comes to one million rubles.

The task now is to speed up the adoption of series 4A engines with in-temperature protection. To do this it is necessary to supply them with sets of thin leads, posistors, and relays. Further perfection of electric engines for agriculture involves improving other design applications, the use of new electrical equipment materials and tougher paint and varnish coatings.

By decision of the board of the Ministry of Electrical Equipment Industry, a special display "Electrical Equipment Industry for Agriculture" was opened in the Electrical Equipment Pavilion at the VDNKh [Exhibition of Achievements of the National Economy]. The purpose of the exhibit is not just to show products but also to organize the exchange of ideas with farm specialists, to take account of their criticisms and suggestions on further improving the quality and reliability of electrical equipment supplied to agriculture.

The ever-increasing demands on quality indicators in electrical equipment, dictated by the very technology of farm production, point up the necessity of providing complete sets of adjustable electric drive and automatic control devices. Such devices, developed on the basis of standardized circuits and designs using blocks based on noncontact semiconductor elements and logic circuits, must play a special role in the technical retooling of agriculture and the organization of production-line methods in farm output.

Special lighting, sources of ultra-violet and infra-red radiation, and electron-ion technology devices--all 110 types of new products developed in the current five-year plan for agriculture--must conform fully to specifications of operation and environmental consideration.

Collectives of electrical equipment enterprises must speed up the development of a number of new products for the electrical mechanization of vegetable farming, plant husbandry, and livestock raising. For example, the Lutsk Electrical Equipment Plant imeni XXV S"yezd KPSS is supposed to supply all sets of electrical equipment for regulating technological processes in Angara hothouses and sets of electrical equipment for grain treatment and storage centers; Ardatov Lighting Equipment Plant is supposed to supply lamps for hothouses; plants of the Soyuzelektromash [All-Union Electrical Machinery Production Association] are to supply single-phase electric engines for microclimate regulation systems.

It is essential to speed up the industrial production of new types of electrical-heating equipment, standardized electric-heating units with improved technical-economic indicators, heat-pump units, electric steam generators of 160 to 400 kilowatts capacity, water heaters with heating elements of the enclosed type with ceramic insulation, and new designs of infra-red radiators to warm young animals and birds.

Considering the observed rise in farm output and taking account of reduced farm population, plans call for doubling the power-to-worker ratio in farm production by 1980 (compared to 1975), and raising agricultural electricity consumption to 130 billion kilowatt hours. By the end of the 11th Five-Year Plan, integrated electrical mechanization of technological processes in livestock and poultry raising should be completed, and automation of farm production should be well underway.

The introduction of integrated electrical mechanization in farm production will yield a substantial economic effect. Calculations show that integrated electrical mechanization of processes in livestock raising, compared with partial electrical mechanization reduces labor outlays by 15 to 20 times per quintal of hog weight gain and by four to six times per 1,000 eggs.

The level of electrification in farm households will rise substantially, approaching the level of household electrification among the urban population. Plans call for more extensive adoption of household and cultural electrical appliances, also partial adoption of floor-installed electric ranges for the preparation of food and electric water heaters with tank storage.

In 1978-1985, the electrical equipment industry will have to develop and assimilate the series production of new types of electrical equipment, apparatuses, and devices for agriculture. These are to include sets of transformer substations of 63 to 630 kilovolt-amperes capacity and sectionalizing points for networks of 10 kilovolts based on equipment already in production, a standardized series of small-size sets of 10 to 35-kilovolt power switchboards of modulus design with cast insulation of epoxy compound, and sets of devices based on integrated microelectronic elements for use in electrical distribution networks intended for farm use. It is also necessary to develop and assimilate the series production of a high-frequency standardized electric engine of 100 to 120 watts for shearing, vine-cutting, and tea picking machines, hand-held tools for vegetable farming, orchard raising, and livestock raising.

To create an artificial climate in livestock facilities, plans call for developing and assimilating the production of a series of electric heating units with axial and centrifugal fans of five to 100 kilowatts. Plans call for developing new electric water heaters and lighting equipment to radiate young animals and birds, and electric-heat storage devices to be switched on during hours when energy system loads dip to warm the water and air in livestock sections.

In the 11th Five-Year Plan there will be a sharp increase in volumes of production of power transformers and power switchboard sets, transformer substation sets, voltage switches, cable and wiring, heaters, and other electrical equipment. This will require workers of the electrical equipment to mobilize all of their efforts and to effectively searcn for internal reserves. To resolve the tasks set forth by the party, a number of enterprises will be remodeled and substantially enlarged. These include the Baku Electrical Machine Building Plant imeni L-letiye Komsomola Azerbaydzhna, and the Elektromashina Plant in Ulan-Ude, which are to produce electric engines for agriculture. A new electric heating equipment plant with special planning-design and technological offices and an experimental facility producing products for agriculture is to be built in Namangan. The plant will produce large-capacity storage water heaters.

The systematic approach to the development and assimilation of new electrical equipment by organizations and enterprises of the Ministry of Electrical Equipment Industry in collaboration with the Ministry of Agriculture, the Ministry of Land Reclamation and Water Resources, Ministry of Machine Building for Animal Husbandry and Fodder Production, the Ministry of Tractor and Agricultural Machine Building, and Soyuzsel'khoztekhnika will make it possible in the 10th and 11th Five-Year Plans to substantially boost the supply of highly-productive electrical equipment to agriculture and raise the level of integrated mechanization and automation of farm production to a new stage.

6854
CSO: 1822

FUELS AND RELATED EQUIPMENT

UDC 658.152.1:622.24

UTILIZATION OF FIXED CAPITAL IN GAS INDUSTRY DRILLING

Moscow EKONOMIKA GAZOVOY PROMYSHLENNOSTI in Russian No 11, 1978 pp 3-12

[Article by N. I. Popova and V. M. Chernyak, All-Union Scientific-Research Institute of Economics, Organization of Production, and Technical-Economic Research in the Gas Industry: "Analysis of Utilization of Fixed Productive Capital in Drilling in the Ministry of Gas Industry"]

[Text] The "Basic Directions of Development of the USSR National Economy in 1976-1980" sets forth this task: "Substantially raise the level of utilization of fixed capital. Formulate and implement a complex of measures designed to raise the output-capital ratio in the various national economy sectors, enterprises, and organizations" ("Materialy XXV s"yezda KPSS" [Materials of the 25th CPSU Congress], Moscow, Politizdat, 1976, p 168). This task is especially vital in the drilling of oil and gas wells, the most energy-intensive subsector of the oil and gas industry.

Since 1972 most of the operational drilling for gas has been done in the Ministry of Gas Industry. In this connection, it is of interest to examine the utilization of fixed assets by drilling enterprises within the Ministry of Gas Industry in a five-year period.

The value of fixed productive capital in Ministry of Gas Industry drilling rose by 47 percent between 1972 and 1976, caused by a 31-percent increase in the volume of ministry drilling during that period and the fact that a larger number of new rigs were put into production (see Table 1). Most of the volume increase (60 percent) was due to intensive production factors. The fact that growth rates of the value of fixed productive capital ran ahead of rates of increase in volumes of drilling was due chiefly to the acquisition of costly drilling rigs, also the organization of new drilling enterprises in remote regions of the Far North and Central Asia. The latter helped to increase the value and proportion of buildings and facilities in the structure of fixed productive capital.

Because the drilling enterprises are engaged in production directly at the gas fields, production buildings constitute only a small share of their fixed assets. But in 1976, the share reached 9.9 percent in the Ministry

Table 1. Structure of Fixed Productive Capital of Drilling Enterprises

Структура основных производственных фондов буровых предприятий

Таблица I

(1) Объединение		(2) Всего основных производственных фондов		(4) В том числе													
				(5) Здания		(6) Сооружения		(7) Передаточные устройства		(8) Машины и оборудование, всего		(9) Из них рабочие машины и оборудование		(10) Транспортные средства		(11) Инструмент и хозяйственный инвентарь	
		(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%	(3) млн. руб.	%
(12) Мингазпром	1972 г.	121060	100	10320	8,5	18610	15,4	666	0,6	80132	66,2	71994	59,5	9624	7,9	1708	1,4
	1976 г.	177906	100	17566	9,9	23139	13,0	776	0,4	112457	63,2	102931	57,6	18010	10,2	5858	3,3
(13) Комигазпром	1972 г.	12981	100	667	5,1	335	2,6	31	0,2	9516	73,3	8547	65,8	2372	18,3	60	0,5
	1976 г.	15637	100	406	2,6	149	1,0	-	-	14578	93,2	13214	84,5	-	-	504	3,2
(14) Кубаньгазпром	1972 г.	17305	100	1551	9,0	371	2,1	191	1,1	14060	81,2	13408	77,5	679	4,0	453	2,7
	1976 г.	21174	100	2271	10,7	833	3,9	248	1,2	14620	69,0	14064	66,4	2689	12,7	513	2,4
(15) Ставропольгазпром	1972 г.	3934	100	286	7,3	86	2,2	6	0,2	3022	76,8	2609	71,4	419	10,7	115	2,9
	1976 г.	6522	100	632	9,7	351	5,4	14	0,2	5303	81,3	4845	74,6	1	0,0	221	3,4
(16) Оренбурггазпром	1972 г.	11630	100	1272	10,9	218	1,9	164	1,4	9714	83,5	9148	78,7	125	1,1	139	1,2
	1976 г.	13943	100	1257	9,0	379	2,7	112	0,8	11743	84,2	11115	79,7	307	2,2	145	1,0
(17) Тюменгазпром	1972 г.	6556	100	2369	36,1	494	7,5	-	-	3575	54,5	2737	41,7	45	0,7	73	1,1
	1976 г.	10038	100	3122	31,1	368	3,7	-	-	6168	61,4	5348	53,3	106	1,1	274	2,7
(18) Укргазпром	1972 г.	14639	100	1453	9,9	306	2,1	59	0,4	12438	85,0	11590	79,2	174	1,2	209	1,4
	1976 г.	26472	100	3070	11,6	321	1,[illegible]	100	0,4	22352	84,4	21617	81,7	273	1,0	356	1,3
(19) Узбекгазпром	1972 г.	5004	100	229	4,6	4	0,1	-	-	4213	84,2	4074	81,4	512	10,2	46	0,9
	1976 г.	12438	100	618	5,0	26	0,2	176	1,4	11469	92,2	11160	89,7	95	0,8	54	0,4
(20) Туркменгазпром	1972 г.	49011	100	2493	5,1	16796	34,3	215	0,4	23594	48,1	19645	40,1	5300	10,8	613	1,3
	1976 г.	69011	100	5849	8,5	20712	30,0	226	0,3	24004	34,8	19417	28,1	14458	21,0	3762	5,5
(21) Норильскгазпром	1976 г.	2671	100	341	12,8	-	-	-	-	2220	83,1	2131	79,8	81	3,0	29	1,1

Key:
1. Association
2. Total fixed productive assets
3. Millions of rubles
4. Including
5. Buildings
6. Facilities
7. Drive mechanisms
8. Machines and equipment, total
9. Including operating machinery and equipment
10. Transport equipment
11. Tools and instruments
12. Ministry of Gas Industry
13. Komigazprom
14. Kuban'gazprom
15. Stavropol'gazprom
16. Orenburggazprom
17. Tyumengazprom
18. Ukrgazprom
19. Uzbekgazprom
20. Turkmengazprom
21. Noril'skgazprom

of Gas Industry, or 1.4 percent more than in 1972. This tendency is characteristic of most of the associations in the ministry. In Ukrgazprom [Ukranian Gas Industry Association], Uzbekgazprom [Uzbek Gas Industry Association], Turkmengazprom [Turkmen Gas Industry Association], and Stavropol'gazprom [Stavropol' Gas Industry Association], for example, the value of buildings rose by 2-2.5 times during that period.

In a number of associations the increase in the value of buildings is due to a substantial rise in drilling volumes and the development of new areas; this brings about expansion of existing production service bases and additional construction. In 1976, for example, buildings amounted to 31 percent of the fixed productive capital in Tyumengazprom [Tyumen' Gas Industry Association]. At the same time, the value of buildings and facilities in Komigazprom [Komi Gas Industry Association] came to 3.6 percent, because this association makes use of the services of a centralized service base operating independently.

The proportion of facilities among the fixed assets of the Ministry of Gas Industry in 1976 came to 13 percent. Moreover, Turkmengazprom accounted for 20.7 million rubles (30 percent) of the ministry's 23.1 million rubles of facilities. This is due to the fact that the item "facilities" includes the value of wells whose construction has been completed but they have not been transferred to the gas field administration's balance because the field has not been prepared.

In the ministry's other associations the value of facilities among the fixed capital structure ranges between 0.2 and 4 percent.

The specific nature of drilling operations accounts for the substantial share of the assets side of fixed capital--operating machinery and equipment. In the five years their value in the ministry rose by 43 percent, amounting to 102.9 million rubles in 1976.

And the value of the assets side of fixed capital is rising more rapidly than the number of drilling rigs. Between 1972 and 1976 the number of drilling rigs in the sector rose by 31.3 percent, while their value rose by 33 percent; this was due to the use of more powerful and costly rigs, also a rise in the number of spare units of equipment.

In Stavropol'gazprom, for example, despite the fact that the volume of work in 1976 declined by 12 percent compared with 1972, the value of fixed productive capital rose by 65.8 percent and the assets portion rose by 1.7 times.

There was no change in the quantity of drilling equipment, but because of the sharp increase in average well depths (from 807 meters in 1972 to 2,680 meters in 1976), rigs of the BU-80 BrD type were replaced by more powerful and costly ones of the Uralmash 125-BD type.

In Tyumengazprom, the amount of drilling equipment rose practically four-fold in the five years, the volume of drilling rose by 5.2 times, while the value of the assets portion of the fixed capital only doubled. In that region, the drilling equipment inventory has been replenished by inexpensive rigs of the BU-80 BRZ and BU-75 BRD type and rigs for structural-prospecting and continuous screw drilling.

In some of the ministry's associations, rates growth in the value of fixed productive assets are running considerably ahead of growth rates in drilling operations, due chiefly to the fact that the drilling equipment is not being utilized rationally. In Ukrgazprom, for example, the rig inventory increased by 66.7 percent and their value in the fixed assets structure rose by 86.5 percent, while the volume of drilling rose only by 26 percent. Drilling rig utilization deteriorated in the association, confirmed by the change in the turnover ratio of drilling equipment, which rose from 1.5 in 1972 to 2.1 in 1976. In addition, the association carries a large amount of non-component equipment on its books, far more than it needs. With 65 rigs, fixed assets include 245 mud pumps, 507 diesels, and 217 steam boilers; this accounts for the excessively high value of fixed productive assets.

In Komigazprom, the value of fixed productive assets rose by 20.5 percent in the five years, while the assets portion rose by 54.6 percent. The drilling volume rose by 34.5 percent, but the average well depth in 1976 increased to 3,703 meters (compared to 3,290 in 1972); this required the acquisition of more powerful rigs. The drilling equipment inventory also changed. In 1972 the association had 26 rigs; in 1976 it had 35. The number of rigs rose by 34.5 percent, diesels by 75 percent, and rotors by 83 percent.

Turkmengazprom improved its utilization of drilling equipment. In the five years, it increased the volume of drilling operations by 76 percent just by making fuller use of rigs.

The proportion of transport machinery in the ministry's fixed assets in 1976 came to 10.2 percent. In regions where drilling is scattered and located far away from production bases, the proportion of transport machinery is higher than the subsector average.

For example, in Kuban'gazprom and Turkmengazprom the proportion of transport machinery came to 12.7 and 21 percent, respectively. Komigazprom and Stavropol'gazprom spent practically nothing on transport machinery, because they are served by specialized enterprises.

The utilization effectiveness of total fixed assets is evaluated by the output-capital ratio. This indicator, which summarizes all production-economic performance, depends on many factors. To determine the extent to which certain of them influence the output-capital ratio, use is made of factor analysis (A. I. Perchik et al., "Ispol'zovaniye osnovnykh fondov burovykh predpriyatiy gazovoy promyshlennosti. Nauchno-ekonomicheskiy obzor" [Utilization of Fixed Assets of Drilling Enterprises of the Gas Industry. Scientific-Economic Survey], Moscow, VNIIE gazprom, 1976, No 10).

The influence of certain factors on the output-capital ratio can be determined by the following formulas:

increase in rig productivity

$$\Delta f_Q = \frac{Q'_{sp}}{K'_{tu} \cdot C' + F'_{so}} - \frac{Q^0_{sp}}{K'_{tu} \cdot C' + F'_{so}} ;$$

rise in turnover ratio

$$\Delta f_K = \frac{Q^0_{sp}}{K'_{tu} \cdot C^0 + F^0_{so}} - \frac{Q^0_{sp}}{K_{tu} \cdot C^0 + F^0_{so}} ;$$

increase in value of drilling equipment

$$\Delta f_C = \frac{Q^0_{sp}}{K'_{tu} \cdot C' + F^0_{so}} - \frac{Q^0_{sp}}{K'_{tu} \cdot C^0 + F^0_{so}} ;$$

reduction (increase) in the value of other fixed productive assets

$$\Delta f_{so} = \frac{Q^0_{sp}}{K'_{tu} \cdot C' + F'_{so}} - \frac{Q^0_{sp}}{K'_{tu} \cdot C' + F^0_{so}} ,$$

where

Q'_{sp} , Q^0_{sp} represent the specific volume of drilling operations during the accounting and base periods, respectively, rubles per rig;

K'_{tu} , K^0_{tu} represent the turnover ratio in the accounting and base periods;

C', C^0 represent the average value of drilling equipment in the accounting and base periods, rubles;

F'_{so} , F^0_{so} represent the specific value of other fixed assets in the accounting and base periods, rubles.

These factors exert differing influence on the output-capital ratio (Tables 2, 3).

In the period being analyzed, the output-capital ratio for the ministry was stable--1.33 rubles per ruble of fixed assets.

An increase in output per rig in drilling led to a 23-percent increase in the output-capital ratio in 1976 compared with 1972 data, due chiefly to increased drilling output per rig and the increase in the volume per meter of drilling because of the increased depths and labor-intensiveness of drilling operational and exploratory wells.

Table 2. Dynamics of Indicators of Fixed Productive Assets in the Ministry of Gas Industry

Динамика показателей основных производственных фондов по Мингазпрому

(1) Показатели	(2) Мингазпром		(3) Комигазпром		(4) Кубаньгазпром		(5) Ставропольгаз-пром		(6) Оренбурггаз-пром		(7) Тюменгазпром		(8) Укргазпром		(9) Узбекгазпром		(10) Туркменгаз-пром	
	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.	1972г.	1976г.
(11) Объем буровых работ в сметных ценах, тыс.руб.	160537	236084	17701	21371	28904	30618	12571	9041	16513	20314	7252	32381	28974	38885	10995	17973	37627	55446
(12) Стоимость основных производственных фондов, всего, тыс.руб.	121060	177906	12981	15637	17305	21174	3934	6522	11630	13943	6556	10038	14639	26472	6004	12438	49011	69011
(13) в том числе:																				
(14) бурового оборудования	71994	102931	8547	13214	13408	14064	2809	4865	9148	11115	2737	5348	11590	21617	4074	11160	19645	19417
(15) прочих	49066	74975	4434	2423	3897	7110	1125	1657	2482	2828	3819	4690	3049	4855	930	1278	29366	49594
(16) Количество буровых станков:																				
(17) в хозяйстве	252	331	26	35	86	40	14	15	25	29	10	36	39	65	20	34	62	61
(18) в бурении	125,9	141,4	13,5	16,2	29,8	28,2	4,8	7,3	11,6	8,1	0,9	4,1	25,7	30,2	9,0	11,2	30,6	34,3
(19) Коэффициент оборачиваемости	2,0	2,3	1,9	2,2	1,9	1,4	2,9	2,0	2,2	3,4	11,1	8,8	1,5	2,1	2,2	3,0	2,0	1,8
(20) Средняя стоимость бурового оборудования в расчете на один станок в хозяйстве, тыс.руб.	385,7	311,0	[illegible]	377,5	238,4	351,6	200,6	324,3	365,9	383,3	273,7	137,1	297,2	332,5	203,7	328,2	316,9	318,3
(21) Объем работ на один станок в бурении, тыс.руб.	1275	1670	1311	1319	970	1086	2619	1348	1423	2508	8058	7898	1127	1288	1222	1605	1230	1616
(22) Стоимость основных производственных фондов в расчете на один станок в бурении, всего, тыс.руб.	961,6	[illegible]	961,6	965,2	[illegible]	750,8	819,6	893,4	1002,6	1721,4	7284,4	2448,3	569,6	876,6	556,0	1110,5	1601,7	2012,0
(13) в том числе																				
(14) бурового оборудования	571,8	727,9	633,1	815,7	450,0	490,7	585,2	666,4	788,6	1372,2	3041,1	1304,4	451,0	715,8	452,7	996,4	642,0	566,1
(15) прочих	389,8	[illegible]	328,5	149,5	130,7	252,1	234,4	227,0	214,0	349,2	4243,3	1143,9	118,6	160,8	103,3	114,1	959,7	1445,9

Key:

1. Indicators
2. Ministry of Gas Industry
3. Komigazprom
4. Kuban'gazprom
5. Stavropol'gazprom
6. Orenburggazprom
7. Tyumengazprom
8. Ukrgazprom
9. Uzbekgazprom
10. Turkmengazprom
11. Volume of drilling operations in estimated prices, thousands of rubles
12. Value of fixed productive assets, total, thousands of rubles
13. Including:
14. Drilling equipment
15. Other
16. Number of rigs:
17. On books
18. In drilling
19. Turnover ratio
20. Average value of drilling equipment per rig on books, thousands of rubles
21. Volume of work per rig in drilling, thousands of rubles
22. Value of fixed productive assets per rig in drilling, total, thousands of rubles

Table 3. Change in Output-Capital Ratio, Rubles/Rubles

(1) Объединение	(2) Фондоотдача, всего		(3) В том числе по факторам				
	1972 г.	1976 г.	Δf	Δf_o	$\Delta f_к$	Δf_c	Δf_{so}
(4) Мингазпром	I,33	I,33	0,00	0,3I	-0,I2	-0,06	-0,I3
(5) Комигазпром	I,36	I,37	0,0I	0,0I	-0,I0	-0,I2	0,22
(6) Кубаньгазпром	I,67	I,45	-0,22	0,I6	0,39	-0,52	-0,25
(7) Ставропольгазпром	3,20	I,5I	-I,69	-I,42	0,85	-I,I4	0,02
(8) Оренбурггазпром	I,42	I,46	0,04	0,63	-0,48	-0,04	-0,07
(9) Тюменгазпром	I,II	3,23	2,I2	-0,07	0,II	0,24	I,84
(10) Укргазпром	I,98	I,47	-0,5I	0,I8	-0,49	-0,I4	-0,06
(11) Узбекгазпром	2,20	I,45	-0,75	0,34	-0,50	-0,58	-0,0I
(12) Туркменгазпром	0,77	0,80	0,03	0,I9	0,04	0,00	-0,20

Key:
1. Association
2. Output-capital ratio, total
3. By factors
4. Ministry of Gas Industry
5. Komigazprom
6. Kuban'gazprom
7. Stavropol'gazprom
8. Orenburggazprom
9. Tyumengazprom
10. Ukrgazprom
11. Uzbekgazprom
12. Turkmengazprom

Factors causing changes in prices of drilling equipment, drilling rig turnover, and also utilization of the inactive portion of fixed assets have a negative effect on the output-capital ratio.

Factor Δf_K reduced the output-capital ratio by 0.12 rubles/ruble. This circumstance indicates worsening rig utilization. The rig inventory increased by 31.3 percent from 1972-1976, while the work load in the drilling process rose by only 12.3 percent; this is due to longer well construction time owing to the considerable amount of time the rigs are in the derrick-erection stage, undergoing testing, or being moved from one site to another.

The increase in rig value had a negative effect on the output-capital ratio. In 1976, for example, factor Δf_C reduced the output-capital ratio by 0.06 rubles/ruble compared with 1972. The rise in the average value of the drilling equipment is also due to the large above-normative stocks of equipment "in dispersion" [v rossypi]. With a 31.3-percent increase in the number of rigs on the books, the number of mud pumps increased by 45 percent, totalling 989 versus requirements of about 660. There was a substantial increase in the number of diesels--2.5 times more than needed. The number of steam boilers more than doubled. The practice of keeping above-normative stocks of equipment "in dispersion" led to a higher average value per drill rig and, as a result, reduced output-capital ratios.

A 57.7-percent increase in the value of the inactive portion of fixed assets --Δf_{80}--caused the output-capital ratio to decline by 0.13 rubles/ruble. To some extent the negative influence of this factor is due to the creation of new drilling enterprises and the extended scattering of the drilling operations front, leading to the necessity of additional building and facility construction, whose value increased by 41 percent. At the same time, additional automotive transport had to be acquired.

In the Ninth Five-Year Plan, the volume of drilling in Kuban'gazprom, Stavropol'gazprom, and Ukrgazprom declined; it rose in Turkmengazprom and Tyumengazprom. There was an analogous change in the output-capital ratio in these associations, due to the influence of the rig productivity factor Δf_{Π}: It was negative in Kuban'gazprom, Stavropol'gazprom, and Ukrgazprom, and positive in Turkmengazprom and Tyumengazprom. Moreover, in Stavropol'-gazprom the negative influence of this factor is due to a 3.3-fold increase in the labor-intensiveness of drilling operations because of the increased well depths; in Ukrgazprom and Kuban'gazprom it is chiefly due to the deterioriation in extensive and intensive utilization of drilling equipment during the drilling process: In Ukrgazprom, despite a substantial reduction in drilling depths the schedule speed rose only slightly, while in Kuban'gazprom it even declined by eight percent. At the same time, this factor had a negative influence on the output-capital ratio in Uzbekgazprom as well, where the volume of drilling increased. This is due to the fact that a 70-percent rise in drilling was accompanied by a 2.5-fold increase in assets over the same period. The increase in the volume of drilling in Tyumengazprom and Turkmengazprom is due to a slight improvement in the utilization of drilling equipment, as a result of which the drilling equipment turnover factor Δf_K had a positive influence on the output-capital ratio.

In Kuban'gazprom, however, the positive influence of this factor was not due to any improvement in equipment utilization at all stages but resulted merely from the fact that 16 rigs were removed from the enterprise's balance sheet in 1976, making it possible to reduce the turnover ratio artificially.

In Komigazprom, Ukrgazprom, and Uzbekgazprom the negative influence of the drilling equipment turnover factor is due to the fact that despite a substantial increase in the rig inventory (35, 67, and 70 percent, respectively), the volume of drilling either did not increase or else increased to a lesser extent.

In all of the ministry's associations, except for Tyumengazprom, the average value of drilling equipment Δf_C reduced the output-capital ratio; this was due to higher prices on drilling equipment, increased volumes of drilling under complex conditions, and greater depths. This influence, moreover, was strengthened by factors relating to the enterprise's performance: Inadequate utilization of drill rig capacities, the presence of large amounts of above-normative stocks of equipment, and others.

The factor is minimum in Stavropol'gazprom--1.14 rubles/ruble. In connection with the transition to the drilling of 3,000-meter wells, light-weight rigs were written off and the inventory was replenished with costly rigs of the Uralmash-125 type, while the total number was retained; this raised the average value per rig.

In Tyumengazprom, this factor caused the output-capital ratio to rise by 0.24 rubles/ruble; this was due to the acquisition of light-weight and relatively inexpensive rigs of the BU-75 BR type. The output-capital ratio was negatively influenced by the specific value of the inactive portion of fixed assets. The main reason for this, as was noted, was the creation of new drilling enterprises and the expansion of existing ones. Analysis makes it possible to determine the basic directions of increasing output-capital ratios in the subsector, foremost among which is improvement of the utilization of drilling rigs in all stages of well construction.

6854
CSO: 8144/0521

FUELS AND RELATED EQUIPMENT

FACTORS IN ROLE OF COAL IN THE LONG-TERM FUEL-ENERGY BALANCE

Moscow ENERGETIKA, TOPLIVO -- DOSTIZHENIYA I PERSPEKTIVY [Power Engineering, Fuel -- Progress and Prospects] in Russian 1977 pp 45-49

[Excerpt from article by Doctor of Economic Sciences, Professor A. S. Astakhov]

[Text] The general trends of the technical-economic development of underground coal mining on the basis of the improvement of existing technological methods must be regarded as not very promising. The economic effect of the technical improvement of the existing coal mining technology in recent decades has been expended largely on the compensation of the unfavorable dynamics of mining-geologic factors (increasing depth of mining, etc.). The quality (grade and ash content) of mined coal has systematically deteriorated by measure of the introduction of existing kinds of technology. The capital-output ratio of the mining industry is steadily increasing. By and large, the trends of the technical development of the industry have been more extensive than intensive. It must be emphasized that the capacities for the development and expansion of machinery, based fundamentally on modern coal mining technology, probably will be exhausted before the end of this century. For these reasons radical changes of the very principles of the technology of coal mining and coal utilization are now an urgent problem. In outlining the contours of underground mining during the first 25 years of the 21st century, continuing on the basis of the improvement of present technology is inconceivable. Furthermore, unfortunately, the specific outlines of future technology cannot yet be clearly drawn. Two new technologies, hydraulic coal mining and underground gasification, which have been tested to some (although different) extent, are exceptions.

The Soviet Union produced 9.2 million tons of coal by the hydraulic (ground) method in 1975, compared with a total of more than 100 million tons in 1952. Hydraulic mining is being used in the Donetsk and Kuznetsk basins. There were seven hydraulic mines and three hydraulic complexes in operation in 1976. Work was conducted in a wide range of mining-geologic conditions in thin, moderately thick and very thick level, sloping and nearly vertical seams. Many different systems have been tested and are being used under a variety of conditions for mining and mechanization of stripping, preparatory and transportation operations in the mine. New hydraulic mines are being planned and built. Thus, from the standpoint of mining operations the hydraulic method has been adopted on an industrial scale. In the meantime work continues on research and development for the purpose of improving hydraulic mining technology and systems.

The basic technological advantages of hydraulic mining are related to continuity, low labor and simplicity of the technological process. There are considerably fewer "junctions" of different processes in hydraulic mining than in the traditional methods of mining, which sharply reduces the number of miners required. Hydraulic mining processes readily submit to automation and remote control and are promising in this respect. The hydraulic method does not require the presence of people and machinery at the cutting face. Therefore roof bracing is not necessary in most cases. The coal slurry can be transported by gravity flow at angles of inclination exceeding 3°. The slurry can be transported in a continuous flow from the cutting face to the drying plant or consumer. The use of hydraulic transport requires substantially smaller transportation excavations (including loading facilities), and this reduces the volume of the corresponding capital mining operations. Other obvious advantages are the great flexibility of the hydraulic coal cutting process at the cutting face and the fact that it is better adapted to tectonic changes of the sedimentary formations within the shaft, which often involves serious problems when traditional long-wall technology is used.

The hydraulic method also has significant advantages with respect to labor safety in the mine. Hydraulic mining has a 2-3 times smaller rate of industrial injury than ordinary mining technology. This is related to the fact that there are no miners at the cutting face and no rolling stock and machinery in preparatory and transportation excavations. The dust content of the air in hydraulic mines also is extremely low and does not exceed 0.25-0.5 mg/m^3. Finally, by virtue of the low labor factor, the total need for miners in underground operations is substantially reduced by the hydraulic method.

The economic advantages of hydraulic coal mining stem from its technological advantages. In connection with fewer basic and auxiliary operations and a reduction of their labor factor labor productivity at operating hydraulic mines in 1975 reached 63 tons per man in the Donbass and 145 tons per man (and up to 195 tons) per month in the Kuzbass, or 1.3-2 times higher than at highly mechanized mines using ordinary coal mining technology. The operating hydraulic mines have a 10-15% lower cost (including 10 times lower for hydraulic transportation) than ordinary mines in the same basins under similar conditions, and the basic cost per ton of coal mined is 25% lower. On the basis of planning data of large new hydraulic mines, the economic indices can be improved significantly in the near future. The planning indices of these hydraulic mines are better than those of mines using ordinary technology. The specific capital investments of a mine with an annual production of 3.5-4 million tons are 18-25 rubles/ton, compared with 30 rubles/ton, the volume of mining operations is 170,000 m^3, compared with 420,000, the volume of construction operations for plants and facilities is 400,000 m^3, compared with 760,000 m^3, the monthly labor productivity per coal miner is 144 tons, compared with 58 tons, the cost of the coal is 3-4.5 rubles/ton, compared with 6-6.5 rubles/ton, the "reduced" cost is 6-7 rubles per ton, compared with 10, electricity and fuel consumption is 1.5-2 times higher than in ordinary mines, but the amount of expended materials is smaller.

It is important to note that the hydraulic method has been tested and proved in a wide range of mining-geologic conditions. The best indices were achieved in moderate and thick seams, but the technical-economic indices are better even within seams than those of traditional technology. The process can be used in all coal seams with an angle of inclination greater than 2°. Weak roof rocks and swelling soils (in about 30% of the coal seams in the Donetsk basin) limit the application of the hydraulic method. The hardness of the coal and the fracturing of the coal seam exert a strong influence on the machinery used for stripping and preparatory operations, and fracturing can increase the productivity of the hydraulic coal mining process by a factor of 8. For hard coal and weak roof rocks it is advantageous to use mechano-hydraulic extraction of the coal and rocks and reinforcement of the work space, or hydraulic washing after loosening of the coal seam, instead of hydraulic cutting of the coal and control of the roof by complete collapse. By and large, the following can be said regarding the range of conditions under which the hydraulic method can find effective application:

the range is, in principle, quite broad;

hydraulic technology offers just as many different technical decisions and systems for different mining conditions as traditional methods, and therefore the extensive application of this method should be preceded by extensive research and development of sufficiently differentiated decisions;

hydraulic coal cutting has great advantages over mechanical cutting under complicated tectonic conditions of stratification;

hydraulic transport of the mine mass can provide a better solution for two difficult problems of the contemporary Donbass, namely a reduction of the volume of expensive capital mining operations and the elimination of labor-consuming multilevel systems with different kinds of transportation from the shaft.

Hydraulic mining is a relatively new method and has great prospects for technical perfection. The pressure of the stream from the nozzle can be increased to 150-200 kg/cm^2 for hard and soft coals. Ways of speeding up mining under various mining-geologic conditions will involve preliminary softening of the coal seam by forcing water into the seam through special drill holes. Hydraulic cutting of coal by means of thin streams at a pressure of up to 500 kg/cm^2 and methods of breaking up rock with a hardness of up to 8-10 by means of pulsating high- and superhigh-pressure (up to 8,000 kg/cm^2 and higher) streams, also appear to be promising. There are great prospects for the improvement of remote-controlled and programmed self-propelled (rolling and walking) water guns and for the development of automated self-propelled hydraulic mining machines. Difficult problems must be solved in the area of the automation of hydraulic transportation, more efficient dehydration of coal slurry and clarification of the water at the surface. However, there can be no doubt that the perfection of hydraulic mining along these lines will be successful, which will even further expand its range of effective application.

Underground coal gasification differs fundamentally from all other coal mining technologies. The experimental and industrial development of this method has been in progress in the USSR for nearly a half century. Five underground coal gasification plants, producing about 1.5 billion m^3 of gas annually, have operated in the Moscow suburbs, in the Donetsk and Kuznetsk basins and in Angren (Uzbekistan). In spite of the long period of development, however, notable progress has not yet been achieved, either in the development of reliable process technology, or from the standpoint of the quality of the gas obtained and its economic indices.

The economic indices that have been achieved at demonstration plants are worse than the design indices and have not been competitive with mines, even under the best conditions. The caloric content of the gas produced by burning coals with vastly different natural caloric contents (from 2,700 to 6,500 kcal/kg) usually does not exceed 800-850 kcal/m^3. The unsatisfactory indices were related basically to the instability of the technological process and to extremely low capacity indices of the plants (from 28 to 160,000 tons of conventional fuel annually). Under these conditions, and in a country with vast reserves of cheap natural gas, underground coal gasification was ignored and is usually not regarded as a possible competitor of current coal mining technology.

At the same time, gasification is cheaper than the production of synthetic gas from coal on the surface.

Most of the potential advantages of underground coal gasification, it is believed, can be realized only after the caloric content of the gas that is produced is increased significantly and the process is made more stable (experiments in these areas have not yet produced positive results). Better indices can be achieved, perhaps, by using oxygen-enriched blasting for gasifying deeper seams, deposited under heavy overburden. If a stable technological process, capable of producing higher-caloric gas than the traditional technology, and using solid coal, can be developed, the following potential advantages of underground gasification may be attainable:

the complete elimination of paid labor under underground conditions;

a substantial reduction of the volume of mining operations and their simplification (the construction of all facilities of underground gasification plants costs only 1/5 of the total basic funds, whereas this figure is about 2/3 at mines);

the feasibility of the complete automation of fuel production;

improvement of boiler operating conditions;

the convenience of using the gas as household fuel (if the caloric content exceeds 4,000 kcal/m^3).

There is reason to assume that if the technological process can be developed and the capacity of the plants can be increased sharply the economic indices of underground gasification might be competitive with traditional coal mining methods, and the establishment of fuel-chemical industries on this basis might improve them even more. But speaking of the future of underground coal mining in the 21st century, it is, perhaps, hard to envision anything much different from the existing technologies, other than underground gasification or geochemical "drilling" techniques, which are analogous to it.

The following general principles, on which the coal mining technology of the first quarter of the 21st century cannot but be based, may be formulated as a generalization of individual research efforts of the experts: the organization of completely automated underground processes; assembly line technology and maximum automation of the entire system of processes; complete extraction and processing of all useful products, deposited along with the coal or extractable therefrom; minimum impact on the environment as a result of the development of "effluent-free" technology. One can imagine a coal-fuel-chemical complex, using a closed cycle for the extraction of coal and for its conversion to energy, oil and chemical products, as the basic type of plant that will employ these technological principles. The success of deep coal processing technology and transportation of the products will determine to a great extent the scope of the development of coal mining and the exploration of new frontiers in coal mining.

Of course, the final decisions will depend on the specific, as yet largely unpredictable prospects of Soviet and world power engineering. However, the "coal version" of power engineering is deserving of prompt and comprehensive development, since it is one of the most probable trends in the foreseeable future.

7872
CSO: 8144/0320

FUELS AND RELATED EQUIPMENT

UDC 662.6/7:658.511.2

METHODS OF CALCULATING MATERIALS-INTENSIVENESS IN FUEL INDUSTRY REVIEWED

Moscow EKONOMIKA GAZOVOY PROMYSHLENNOSTI in Russian No 11, 1978 pp 12-21

[Article by V. A. Bugrov, V. I. Potapov, and Ye. P. Bochkov, VNIIKTEP of USSR Gosplan: "Determining the Materials-Intensiveness of Fuel Extraction"]

[Text] The historic 25th CPSU Congress posed the challenge of sharply raising the efficiency of public production. This is the most important part of our overall economic strategy in the current phase of building communism. Reducing the materials-intensiveness of production is one of the ways to solve this problem. In the accountability report to the 25th party congress L. I. Brezhnev pointed out: "The country's needs for energy and raw materials are continuously growing, and their production is becoming more and more expensive. Therefore, to avoid an excessive increase in capital investment we must work for more rational use of resources, which includes reducing the materials-intensiveness of output, using cheaper and more efficient materials and using them economically."* Although the sectors of the fuel industry have comparatively low materials-intensiveness (petroleum and gas extraction are capital-intensive and the coal industry is labor-intensive), an analysis of their materials-intensiveness is interesting primarily from the point of view of finding intersectorial proportions for development of the fuel-energy complex. Because the share of the Eastern regions in fuel extraction is steadily growing, which means that shipping distance is also growing, a comparison of materials-intensiveness with due regard for expenditure of materials to transport the fuel (which accounts for roughly half of the total freight traffic of the country) is very important.

Because development of the fuel and energy sectors takes about 28 percent of capital investment in industry, it is also important to compare the materials-intensiveness of capital construction in fuel

---

* "Materialy XXV S'yezda KPSS" (Materials of the 25th CPSU Congress), Moscow, Politizdat, 1976, p 43.

extraction. Thus we must find a technique for determining the materials-intensiveness of extracting and transporting different types of fuel in operations activity and capital construction.

It is well-known that the materials-intensiveness of output is described by the ratio of materials expenditures to production of output for a corresponding time period.

The following methods are used to determine materials-intensiveness:

1. relating materials expenditures to output in monetary form (rubles per ruble of gross or net output);

2. relating expenditure of materials to output in physical measurements (ton per ton);

3. relating materials expenditures in physical terms to production of output in monetary form (tons per ruble of gross and net output);

4. relating materials expenditures in monetary form to production of output in physical terms (rubles per ton).

The Methodological Instructions of USSR Gosplan for working out state plans for development of the national economy recommend using the ratio of materials expenditures (without depreciation) per ruble of commodity (gross) output as the index of efficiency of use of material resources for the sectors of physical production, associations, and combines.

In those industrial sectors that produce uniform types of output, calculations of the efficiency of use of materials are also made for the production of output in physical terms.

Considering the broad assortment of materials used in the extraction and transportation of particular types of fuel, relating materials expenditures in tons to the volume of fuel in natural terms, that is, tons, is not only economically inexpedient but also not feasible, especially if we consider the different heat of burning of the types, grades, and varieties of fuel.

Because of the breadth of assortment of materials used with relatively low expenditure norms for them it is also inadvisable in practice to relate materials expenditures in physical terms to extraction and transportation of fuel in physical terms.

The difference in the heat of burning of particular types of fuel and also for coal by basins, deposits, and grades make the index of materials expenditures defined as the ratio of materials expended in monetary form to production of output in physical terms incompatible.

Therefore, of all the methods considered for calculating the materials-intensiveness of the extraction and transportation of different types of fuel, the only acceptable one may be considered to be calculation of materials expenditures in monetary form (without depreciation) per ruble of growth in net output.

It should be observed that calculating the materials-intensiveness of production of output per ruble of net output is not envisioned by the methodological instructions of USSR Gosplan. However, determining this index would reflect the materials-intensiveness of production more correctly because it makes it possible to preclude the influence of expenditures of past (embodied) labor on its results.

Table 1 below shows a comparison of the average materials-intensiveness of extraction of the primary types of fuel, natural gas, petroleum, and coal, and changes in these figures over time.

Table 1. Materials-Intensiveness of Extracting Natural Gas, Petroleum, and Coal in 1970 and 1975 (natural gas in 1970 = 100%)

Fuel	1970 A	1970 B	1975 A	1975 B
Natural Gas	100	200	175	189
Petroleum	138	200	212	294
Coal	288	228	275	228

Key: (A) For Gross Output;
(B) For Net Output.

Auxiliary materials, containers, fuel, energy, and the like, that is those objects of labor expended for the technological, general production, and economic needs of the enterprises, as well as tools, furnishings, and special devices and items not classified as fixed productive capital under current procedures are included in materials expenditures.

Materials expenditures were calculated by multiplying their share of the prime cost of fuel extraction by its full prime cost.

The share of these materials expenditures was determined on the basis of report figures and their share in other monetary expenditures, which are about 40 percent for petroleum and natural gas extraction, was determined by analyzing actual figures for 1970 and 1975.

The share of materials expenditures in "other financial expenditures" for open-pit coal extraction is 60 percent, while for underground coal mining it is 30 percent; given the existing ratio between open-pit and underground coal mining (one-third and two-thirds respectively), this also averages 40 percent.

Materials expenditures for geological exploration were included in other materials expenditures not distributed by elements in petroleum and gas extraction.

Analysis of Table 1 shows that the materials-intensiveness of natural gas and petroleum extraction calculated for growth and net output shows a tendency to increase, while for coal it stays the same in the calculation for net output and decreases by five percent when calculated for gross output. The greatest increase in the level of materials-intensiveness of extraction in 1975 compared to 1970 figures is observed for gas (75 and 89 percent calculated for gross and net output), while the increase is slightly less for petroleum (54 and 47 percent respectively).

Despite the stabilization of the level of materials-intensiveness in coal extraction calculated for gross output and the slight decrease when calculated for net output, the overall dimensions of the materials-intensiveness of coal extraction continue to be highest, exceeding the figures for petroleum and natural gas extraction by 1.3 and 1.57 times when calculated for gross output in 1975. When calculated for net output in 1975 the materials-intensiveness of coal extraction is 1.21 times higher than the corresponding index for natural gas, but 22.4 percent below the materials-intensiveness of petroleum extraction.

Considering that the prices for particular types of fuel are not comparable and that their heat of burning differs, we believe that the method of calculation based on the ratio of materials expenditures in monetary form per unit of a standard fuel should be considered more correct. This method offers an opportunity to compare the materials-intensiveness of extracting types of fuel that differ qualitatively by heat of burning. The following coefficients are adopted for converting natural fuel into standard fuel: 1.43 for petroleum, 1.17 for natural gas, and 0.7 for coal.

The materials-intensiveness of extracting natural gas, petroleum, and coal in 1970 and 1975 when calculated per ton of standard fuel is shown in Table 2 below.

Table 2. Materials-Intensiveness of Extracting Natural Gas, Petroleum, and Coal (without depreciation, materials-intensiveness of natural gas extraction in 1970 = 100%).

Fuel	1970	1975
Natural Gas	100	175
Petroleum	230	330
Run Coal	888	858

A comparison of the figures in Table 2 for 1975 with the figures in Table 1 for 1975 for gross output shows that the difference in the level of materials-intensiveness of coal extraction is 3.0 times greater than for natural gas and 2.0 times greater than for petroleum.

The reason for this is a flaw in existing average USSR prices for natural gas, petroleum, and run coal which sets the average USSR price for run coal much higher than the price for natural gas and petroleum while its heat of burning is significantly lower.

If the prices for these types of fuel were matched to their heat of burning, the relationship among the materials-intensiveness of the different types of fuels when calculated for gross output and standard fuel would be almost the same.

However, considering the higher consumer value of petroleum and natural gas when compared to coal, the differing efficiency for the consumer of using these types of fuel, different trends towards change in prime cost, specific capital investment, and calculated expenditures, and also the level of world prices for petroleum, the ratio of prices for petroleum, natural gas, and coal should take these and other factors into account.

The flaws in existing average USSR prices for natural gas, petroleum, and coal, and the special features of the formation of net output with a high share of wages in the coal industry and high profit in the petroleum and gas industry, make the index of materials-intensiveness figured for net profit ill-suited for comparison.

Because the prices for the particular types of fuel today do not correspond to socially necessary labor expenditures, the only acceptable method that makes it possible to put the materials-intensiveness of the different types of fuel in compatible form is calculation per ton of standard fuel. This method also makes it possible to determine the comparative materials-intensiveness of extraction and transportation of fuel, but this does not preclude the necessity in the more distant future after refinements of the price formation system of making the calculation for gross or net output. But in this case the quality of the fuel must be considered in the price when calculating materials-intensiveness (especially for particular deposits). The quality factors that must be considered are potential content of light petroleum products, sulfur and paraffin content, and quality of directly distilled fractions of gasoline (octane rating) and diesel fuel (cetane rating) for petroleum, fraction composition and sulfur content for natural gas, and ash content, humidity, sulfur content, and the transportation factor for coal.

Following the same methodological principles, we must calculate the materials-intensiveness of fuel transportation, which will make it possible to determine the total materials-intensiveness of extraction and transportation with due regard for transportation of the fuel to consumption regions.

It should be observed that the sectors of the fuel industry have low materials-intensiveness of extraction but high capital-intensiveness, whereas the coal industry also has substantial labor-intensiveness. This is a result of the high level of materials expenditures to build fuel industry enterprises.

Therefore, it is important to calculate materials-intensiveness not only for the extraction and transportation of particular types of fuel but also for capital construction. The calculation of materials-intensiveness of the extraction and transportation of fuel taking into account depreciation deductions for fixed productive capital answers this problem. However, considering that elements such as wages with deductions for social insurance, the profit of construction organizations, and the like are also reflected in fixed productive capital, a direct calculation of the materials-intensiveness of capital construction should be considered more correct. We should observe that the share of materials expenditures in total capital investment for the development of the gas extraction, petroleum extraction, and coal extraction industries has hardly changed at all over time. Thus, in the Eighth Five-Year Plan the share of material expenditures in construction and installation work for the extraction of natural gas, petroleum, and coal was, respectively, 59.8, 56.4, and 56.1 percent; in the Ninth Five-Year Plan the figures were 52.6, 56.2, and 56.7 percent, and in the 10th Five-Year Plan (according to calculation) they will be 61.8, 51.6, and 59.6 percent.

The share of materials expenditures with equipment in direct capital investments in the development of the gas extraction, petroleum extraction, and coal extraction industries in the Eighth Five-Year Plan was, respectively, 68.9, 65.9, and 68.0 percent, while in the Ninth Five-Year Plan the figures were 66.3, 65.0, and 70.9 percent, and the 10th Five-Year Plan (according to calculation) they will be 69.8, 66.2, and 71.6 percent.

The increase in the share of materials expenditures including equipment and direct capital investments in the coal extraction industry when compared to petroleum and gas extraction results from a higher level of equipment use in coal extraction.

At the same time, of course, as the scale of fuel extraction increases an ever-larger part of newly introduced capacities will be used to maintain the level of fuel extraction already achieved. For this reason we believe it is more correct to calculate the materials-intensiveness of capital construction not for the absolute growth of petroleum extraction but for newly launched capacities.

Table 3 below illustrates this point. From Table 3 we can see that the materials-intensiveness of fuel extraction calculated for capacities being introduced by all types of fuel is considerably lower than the calculation for absolute growth; with the same general trend toward change in this figure, the trend has a "softer" look when calculated for capacities introduced as compared to growth in extraction.

Table 3. Materials-Intensiveness of Capital Construction in the Sectors of the Fuel Industry (materials-intensiveness of natural gas in 1966-1970 = 100%)

Indexes	1966-1970 G	P	C	1971-1975 G	P	C	1976-1980 G	P	C
For Absolute Growth									
Materials-Intensiveness in Direct Capital Investment:									
Without Equipment	100	76	238	104	94	163	77	142	161
With Equipment	148	113	529	121	136	385	111	204	393
For New Capacities									
Materials-Intensiveness in Direct Capital Investment:									
Without Equipment	43	38	126	34	33	99	32	42	101
With Equipment	64	56	259	39	48	235	45	60	24

Key: (G) Gas; (P) Petroleum; (C) Coal.

In the Ninth Five-Year Plan there was a slight drop in the materials-intensiveness of capital construction, but, according to calculations, it will rise somewhat for all types of fuel in the 10th Five-Year Plan.

The reduction of materials expenditures for operating activity and capital construction to a single comparable type deserves attention, because only when this is done can we make sufficiently complete judgements about aggregate materials expenditures for fuel extraction and creation of the material-technical base for fuel production. Because we lack such a technique, the authors used a procedure based on calculation of adduced expenditures. For complete comparability in capital construction we took only materials expenditures in direct capital investment, including equipment, using a single efficiency coefficient of 0.12 for all sectors of the fuel industry, while materials expenditures in operating activities were taken without depreciation deductions because a consideration of them would have caused us to count materials expenditures twice in capital construction. Moreover, owing to difficulties in identifying materials expenditures for capital repair of fixed industrial productive capital, these expenditures were not taken into account.

The calculated materials-intensiveness of extracting natural gas, petroleum, and coal in the country for absolute growth in extraction and new capacities calculated against standard fuel is given in Table 4 below.

Table 4. Calculated Materials-Intensiveness of Extracting Natural Gas, Petroleum, and Coal in 1970 and 1975 (natural gas in 1970 calculated for capacities launched = 100%).

Indexes	Natural Gas	Petroleum	Coal
Calculated for New Capacities			
1970	100	108.2	474.0
1975	77.5	113.1	438.0
Calculated for Absolute Growth in Fuel Extraction			
1970	210.1	183.5	830.0
1975	185.5	228.5	636.0

With the increasing scale of open-pit coal extraction the calculated materials-intensiveness for absolute growth in coal extraction in 1971-1975 dropped by 23.4 percent, while the incorporation of highly productive gas deposits made it possible to reduce materials-intensiveness in natural gas extraction by 11.8 percent when, at the same time, it was increasing by 24.5 percent in petroleum extraction. These trends caused changes in the ratios among calculated material-intensiveness for absolute growth in natural gas, petroleum, and coal from 1:0.87:3.95 in 1970 to 1:1.23:3.43 in 1975. The same pattern is observed in the calculation for capacities launched, except that the ratio among calculated materials-intensiveness figures for natural gas, petroleum, and coal in 1970 was 1:1.08:4.74 and in 1975 it was 1:1.46:5.65. The change in the ratio of calculated materials-intensiveness figured for absolute growth in fuel extraction and capacities launched is linked to a change in the proportion of launched capacities being used to maintain the existing level of extraction of various types of fuel. In this respect natural gas is in the best position.

Thus, a comparison of different methods of calculating the materials-intensiveness of extraction of natural gas, coal, and petroleum enabled us to establish that calculation per ton of standard fuel is most acceptable. We propose that this technique be used to calculate materials-intensiveness in operating activity and capital construction and the materials-intensiveness of different sectors of the fuel industry.

It is better to calculate the materials-intensiveness of capital construction for capacities launched.

Improvement in the development of prices for different types of fuel will make it possible to change from calculating materials-intensivenss per ton of standard fuel to calculation of materials-intensiveness per ruble of gross or net output.

Trend analysis of the materials-intensiveness of the extraction of various types of fuel for the country as a whole has resulted in the identification of trends and changes in this index.

11,176
CSO:8144/0520

END

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100010056-8